tannic acid yielded a chlorine derivative resembling that mentioned above, which gave a brilliant magenta colour with sodium sulphite. Moreover, from a specimen of jute fibre which had become rotten through shipment in a damp state, a body was extracted having all the properties of a tannin. Esparto resin, when fused with potash, furnished phloroglucin and much protocatechuic acid. The general identity of these non-cellulose constituents with the class of astringent substances or tannins is thus fully established.

The authors then give details as to the bromine and chlorine compounds obtained from Esparto resin; they next investigate the action of caustic alkalies on the chlorine derivative $C_{19}H_{18}Cl_4O_9$ of jute-fibre, by which action two atoms of chlorine were removed, as is the case with chloranil. By the action of bromine on jute-fibre a brominated compound was obtained similar to that from Esparto resin. As regards the constitution of these derivatives the authors are inclined to believe that their molecule is built up round chloranil as a centre. Chloranil, when boiled with sugar, forms a brown substance which behaves with alkalies and chlorine exactly like the aromatic substance obtained from bast fibres.

The authors next consider the wider problem of the relation of the cellulose to the non-cellulose constituents of bast-fibres and the relation of both to the life of the plant. In these points they have been anticipated by the investigations and inferences of the physiological botanists Sachs, Sachsse, &c., who have stated that cellulose is directly derived from starch or its physical equivalents sugar, fat, or inulin, and is not a product of the resolution of a proteid molecule; this formation of cellulose is attended with the evolution of carbonic anhydride. The chemical changes are expressed by Sachsse thus:—

$$n(C_{36}H_{60}O_{30}+_{30}O)=n(_{30}CO_2+_{24}H_2O+C_6H_{12}O_6);$$

the molecule $nC_6H_{12}O_6$ is then transformed into substances having the atomic ratio $C_6H_{10}O_5$. The formation of cellulose usually occurs in those portions containing no chlorophyll; the formation of starch, on the other hand, is associated with the presence of chlorophyll and the evolution of oxygen. The lignification of fibres originally consisting of pure cellulose is held by Sachs to be a modification of the cell-substance (cellulose), and not an infiltration of substances from the contents of the cell. This change is expressed by Sachsse thus:—

$$\underset{\text{Cellulose}}{C_{24}H_{40}O_{20}} = 5H_2O + \underset{\text{Lignin}}{C_{18}H_{24}C_{16}} + C_6H_6O_5.$$

Sachsse thinks that it is to this more highly oxidised molecule $C_6H_6O_5$ that the origin of the tannins is to be referred. The authors dissent from this equation, and think that bodies resembling metapectic acid $C_8H_{14}O_9$ are formed. Such bodies have been found by Kolbs in linen-fibre, and by the authors in the portions of the jute-fibre near the roots (jute-cuttings). Sachs maintains that the tannins are degradation products of cellulose and are to be looked upon as excreta, like urea in the animal. If now the extreme terms of the developmental series are the cellulose and the tannins, it devolves upon the chemist to investigate the intermediate stages of the transformation. The authors therefore treated jute fibre with dilute (5 per cent.) sulphuric acid at moderate temperatures; as a result of these experiments they conclude that the jute fibre consists for the most part not of cellulose, but of a transition form between the original carbohydrate and its ultimate modification of a soluble astringent. To this transitional modification the authors give the name of *bastose*, as the authors consider there are many celluloses, so also there will be many forms of bastose. The aromatic derivatives derived from these bastoses the authors propose to call *bastins*. The authors then adduce various arguments to prove that the conversion of carbo-hydrates into aromatic bodies is possible. Thus Hoppe Seyler, by heating starch to high temperatures with water, formed pyrocatechin. Gun-cottons or nitrocelluloses degrade spontaneously into bodies of the pectic class, and the authors, by the action of strong sulphuric acid on dextrin at 7 per cent., obtained a black substance which furnished a chlorinated product resembling in its properties the chlorobastin previously described. The formation of the black substance was accompanied with that of acetic and carbonic acids. The authors conclude the paper with the results of several miscellaneous researches bearing on the subject. The stony concretions of pears can be converted into cellulose, and a chlorobastin giving the colour reaction with sodic sulphite. The origin of tannins, the reactions of jute substance under high pressure, the reduction of indigo by jute, the reaction of linseed oil with sulphuric acid, and additional observations on the chlorobastins, are the titles of these miscellaneous researches. The authors finally embody their results in a diagrammatic survey or geneological tree: Carbonic anhydride and water, by the action of light, protoplasm and chlorophyll, form starch; starch and oxygen during the growth of the plant give off CO_2 and H_2O, pectin and cellulose being formed. The starch passes through bastose to bastin. Bastose can be split up in various ways by chlorine into cellulose and chlorobastin, by dilute sulphuric acid into furfurol, acetic acid, &c., and tannins (insoluble) by decay into pectic acid, and tannins (soluble) by nitric acid into cellulose and a nitro body. Bastin, by fusion with KHO, furnishes phloroglucin and protocatechuic acid, and by chlorination carbonic acid and chlorobastin.

NOTES FROM THE OTAGO UNIVERSITY MUSEUM

I.—*On a New Method of Preserving Cartilaginous Skeletons and other Soft Animal Structures*

ON reading Professor Miall's account of the employment of glycerine jelly for the preservation of anatomical preparations (NATURE, vol. xviii. p. 312), it occurred to me that many of the more solid and less complicated structures, usually kept in spirit, might possibly be preserved by thoroughly impregnating them with glycerine jelly and then allowing them to dry. I was able to make very few experiments in this direction before leaving England, but during the present year I have tested the method I am about to describe enough to make me feel tolerably confident in recommending it as of especial value for cartilaginous and partially ossified skeletons, and useful also for such things as hearts, stomachs, and other viscera, and for the exoskeletons of Crustacea, Echinoderms, &c.

I will first describe the method adopted in preparing the skeleton of a fresh Elasmobranch. The fish is eviscerated, the gills removed and placed in strong spirit, and the body plunged into water a few degrees below the boiling point. An immersion varying from a few seconds to a few minutes serves to soften the muscle and connective tissue to such an extent that they can readily be stripped from the cartilage without injury to the latter. This I find the only satisfactory way of cleansing many parts of the elasmobranch skeleton, notably the vertebral column. In the case of the gills even a momentary immersion in hot water is liable to cause a separation of the cartilages; they are therefore best prepared in the cold, after the ligaments have been well hardened with alcohol. After the remainder of the skeleton is cleansed it may either be put through the preserving process at once, or previously hardened in alcohol—the latter alternative is the best, since it diminishes subsequent shrinking, but it is not essential and may very well be dispensed with in the case of large skeletons, for the sake of saving the otherwise large expenditure of alcohol. I need hardly say that it is always advisable to separate the skull from the vertebral column, the pectoral fin from the shoulder girdle, &c., as in this partially disarticulated condition the skeleton is more easily manipulated, besides being more convenient for future use. In the case of large sharks it is also necessary to divide the vertebral column into pieces small enough for the vessel used in the preserving process.

The various parts of the skeleton, with or without previous hardening in alcohol, are then placed in "glycerine fluid" of the following composition:—

Glycerine	1 litre.
Water	1 ,,
Alum	20 grm.
Corrosive sublimate	10 ,,

This fluid is a modification of Wickersheimer's, the chief alteration being the omission of alcohol: the alum may also be omitted if the specimen has been hardened with alcohol. After remaining in the fluid until thoroughly permeated—two days to a week, according to size—the skeleton is transferred to the following glycerine jelly:—

Gelatine	150 grm.
Glycerine	1 litre.
Water	1 ,,
Corrosive sublimate	10 ,,

The jelly is kept at a heat just sufficient to melt it, in an earthenware vessel (neither the glycerine fluid nor the jelly should be allowed to come in contact with metal), over a water

bath, and the specimen is retained in it for about three or four days. It is of course advisable to have vessels of various sizes, so as not to use more jelly than is absolutely necessary. I find that a small pudding-basin, a vegetable-dish, a soup-tureen, and an earthenware foot-bath form a very useful set of vessels; a galvanized iron wash-tub serving as an excellent water bath. For ordinary purposes I use gelatine-glue instead of pure gelatine, the former being only one-fourth the price of the latter. Phenol may be substituted for corrosive sublimate.

After removal from the glycerine the specimen is thoroughly drained, and placed in a dry room protected from the dust. Such parts as the vertebral column, the fins, and, in most cases the skull may be left to dry without further care, but thick or strongly curved structures, such as the jaws and shoulder girdle, should be fastened out while drying with strappings of tape, small wooden or cardboard supports, &c., as otherwise a certain amount of twisting is inevitable.

When no more shrinking or "buckling" is perceptible—it is generally advisable to allow some weeks for this—the specimen is varnished with a solution of white shellac in rectified spirit. This should be done in a warm room, as the slightest damp produces precipitation of the shellac. After two or three coats of this varnish the cartilage is found to have a dry and smooth but not too glossy surface.

In mounting the skeleton the best way is to support each part separately on a light wire cradle, so that it can at any time be removed for examination. If it is found necessary to articulate any of the parts, it is advisable to use platinum wire.

In preparing the chondrocranium of Teleostei (*e.g.* Salmo) it is again advisable to have recourse to parboiling: the membrane bones can then be easily removed and the cartilaginous brain-case, Meckel's cartilages, and the branchial arches prepared as above. Skeletons of earlier mammalian fœtuses must be put through the process *in toto*, the chief disadvantage of this method being that the bones, being impregnated with gelatine, never become very white. In later fœtuses the epiphyses of the long bones and other cartilages are readily removed, and may then be prepared separately. In disarticulating mammalian skulls it is a good plan to remove the mesethmoid and prepare it in the above method, thus preserving an important part of the skull which the student, as a rule, never sees unless he takes the trouble to dissect it out for himself.

Up to the present time my two assistants—to whose care and patience it is only right that I should express my indebtedness—have prepared entire skeletons of Carcharodon, Cestracion, Raja, Ceratodus, and calf fœtus, chondrocrania of Alopecias, Acanthias, Salmo, and Petromyzon, and mesethmoid of the sheep. Some of these have now been prepared for several months, and the small amount of shrinkage may be gathered from the fact that an entire skeleton of Ceratodus lost only 1-36th of its length, and that the membrane bones of the Trout, which were separated from the chondrocranium before the preparation of the latter, fitted afterwards into their places with great accuracy. I have not yet, however, been thoroughly successful with the jaws of the Elasmobranchs, as hitherto there has always been a slight cracking of the superficial calcareous crust, which in the jaws is much thicker than elsewhere; but as this is sometimes seen, to a slight extent, even in spirit specimens, I do not at present see how to prevent it entirely. With purely cartilaginous structures the success of the method is very marked: for instance, the gill-arches of Cestracion and of Raja, prepared with the delicate branchial rays, and in the former genus, the extra-branchial cartilages have, after several weeks, their flexibility and translucency unimpared.

Other organs, for the preservation of which I have found this method successful, are hearts, stomachs, intestines, &c. Even the entire alimentary canal with the liver spleen and pancreas of, for instance, a skate, may be prepared with a tolerable amount of success. All these soft parts must, of course, be first thoroughly hardened with alcohol or chromic acid. I have also obtained a fairly good preparation of the skate's brain *in sitû* with the intracranial portions of the cerebral nerves, but as far as my present experience goes, I hardly think that my method is likely to be as successful as Giacomini's for brains (*Journ. of Anat. and Phys.*, January, 1879).

I may mention that I have tried a modification of Giacomini's method for cartilaginous skeletons, but hitherto have not found it so successful as the glycerine jelly process.

I have had some little success in preserving Crustacea, Echinoderms, &c., so as to retain their natural colour and flexibility, but further experiments are wanted in this direction. I have also made one or two attempts to apply the method for the preparation of skins of fishes, amphibia and reptiles for stuffing: the few experiments already made show a distinct improvement upon the ordinary dried skins, both in the preservation of the natural colour and in the diminution of shrinking. Some modification of the process may possibly be useful for the wattles, &c., of birds. In spite of the obvious objections to stuffed specimens, they could be ill-spared in a public museum, neither skins nor spirit specimens being suited to replace them, and it would certainly be an advance in museum technique, if, for instance, the ordinary brown, shrivelled, and highly varnished specimens of fishes could be replaced by something a little more life-like.

T. JEFFERY PARKER

Dunedin, N.Z., November, 3rd, 1881

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—In a Convocation held on February 7 the sum of 250*l.* was voted to the Linacre Professor for apparatus for the Physiological Laboratory.

Dr. T. K. Chambers, Christchurch, has been nominated to represent the University in the General Council of Medical Education in place of the late Prof. Rolleston.

The Curators of the Bodleian library have elected Mr. E. W. B. Nicholson, M.A., of Trinity College, as Bodley's Librarian in place of the late Mr. Coxe.

The Examiners for the Burdett Coutts Geological Scholarship have given notice that the examination will be held on Monday, February 27 and three following days, at 10 a.m. The scholarship is tenable for two years, and is open to all members of the University who have passed the necessary examinations for the degree of B.A., and shall not have exceeded their twenty-seventh term.

SCIENTIFIC SERIALS

Journal de Physique, January.—On the limits of electrolysis, by M. Berthelot.—Note on Prof. Clerk Maxwell's memoir on the theory of maintenance of electric currents by mechanical work without using permanent magnets, by M. Brillouin.—Experimental researches on Purkinje's phenomenon, by MM. Macé de Lepinay and Nicati.—Varnish for writing on glass, by M. Crova.

Reale Istituto Lombardo di Scienze e Lettere. Rendiconti, vol. xiv. Fasc. xviii.-xix.—Zoological annotations, by Prof. Pavesi.—On protistological analysis of drinking water, by Prof. Maggi.—Another case of a single kidney in man, with incomplete development of the spermatic vesicle and the prostate on the defective side, by Prof. Sangalli.—Vines and their enemies in 1881, by Prof. Garovaglio.—On some fossils of the Upper Jurassic found in the western Venetian Alps, by Dr. Parona.—Experimental researches on the physiological and therapeutic action of cocaine, by Prof. Morselli and Dr. Buccola.—Reduction of integrals of algebraic functions to integrals of rational functions, by Prof. Formenti.—The double quadratic transformation of space and its application to the non-Euclidian geometry, of space, by S. Aschieri.

Fasc. xx.—Reports on works presented and on prize competitions, also announcement of prize subjects.

Atti della R. Accademia dei Lincei, vol. vi. fasc. 3.—New series for expressing the heliocentric coordinates in function of the mean anomaly, by S. de Gasparis.—Contribution to the anatomy of leaves, Part II., by S. Briosi.—On the present regression of glaciers of the Alps, by S. Stoppani.—Reports on prize competitions. The royal prize in biology (10,000 lire) is divided between Prof. Mosso and Prof. Trinchese, the work of the former being sphygmographic researches on the circulation of the blood in the human brain; and that of the latter on Italian maritime fauna (describing several new species), and on the early development of mollusca. The Royal prize in mineralogy and geology (10,000 lire) is awarded to Prof. Taramelli, for a work on the geology of the Venetian province. In physical science Prof Poloni is awarded a prize of 1500 lire, for a memoir on the permanent magnetism of steel at different temperatures.—The salient features of these and other memoirs are noted.

Vol. xi. fasc. 4.—Researches on movements of the intestine, by Signori Mosso and Pellacani.—On the action of halogenated